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Forest Pest Management Report

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ANNUAL SOUTHWESTERN REGION
PEST CONDITIONS REPORT
1984

April 1985

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FOREWORD

Information on forest insect and disease conditions in the Southwest during 1984 was compiled with the assistance of the Forest Pest Management staff, Regional Office; Robert Celaya, Arizona Forestry Division; and Anthony H. Smith and John O. Johnsen, New Mexico Department of Agriculture.

ACKNOWLEDGMENT

We are sad to report the death of William G. Telfer, an entomologist with Forest Pest Management. Bill died in an aircraft accident while performing an aerial detection survey of the Lincoln National Forest. During his tenure with Forest Pest Management, Bill made numerous contributions to the advancement of forest pest management within the Region. His efforts, professionalism, humor, and friendship will be deeply missed by his coworkers

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INSECT AND DISEASE CONDITIONS

Conditions in Brief

Bark beetle-caused tree mortality generally occurred at relatively low levels throughout the Southwest during 1984. Spruce beetle-killed trees were the exception. Spruce beetle populations remained at outbreak levels on the Fort Apache Indian Reservation and bordering lands of the Apache-Sitgreaves National Forests (Mount Baldy Wilderness Area), Arizona, and portions of the Carson and Santa Fe National Forests (Pecos Wilderness), New Mexico. Trees killed by the mountain pine beetle, western pine beetle, and Ips beetle were widely scattered throughout the pine type, and mainly consisted of single, small group tree mortality.

Lepidopteran defoliators continued to cause widespread defoliation throughout the mixed conifer and aspen forest types on Federal, State, and private lands. Defoliation caused by the western spruce budworm nearly doubled from 371,500 acres in 1983 to over 692,100 acres in 1984. Most of the observed defoliation occurred in New Mexico. Aspen defoliation, caused by the large aspen tortrix and to a lesser degree by the western tent caterpillar, was extensive throughout the aspen type, also in New Mexico. In Arizona, the western tent caterpillar caused small pockets of aspen defoliation along the North Rim of the Grand Canyon National Park.

Ponderosa pine dwarf mistletoe continued to be the most damaging disease agent in conifers in the Southwest. Reductions in growth and yield have increased in the last 25 to 30 years. Surveys conducted on the Coconino and Kaibab National Forests in 1984 indicated that since 1957 there has been an overall increase in mistletoe incidence; average mistletoe intensity in stands has also increased. In all, 56,346 acres of the commercial ponderosa pine timber type were surveyed on the two Forests. Survey results will be used to assist in the development of new management strategies and silvicultural treatment alternatives. Dwarf mistletoe incidence averages 35 to 40 percent in commercial ponderosa pine stands Region-wide, and losses in sawtimber are equivalent to or greater than the annual harvest volume for each of the surveyed forests. Dwarf mistletoe suppression projects were conducted on 1,038 acres of heavily infected ponderosa pine; presuppression surveys were conducted on 53,982 acres.

Dwarf mistletoes continued to cause significant losses in Douglas-fir and spruce. Preliminary estimates of mistletoe incidence in the Douglas-fir, spruce, and spruce-fir timber types indicate a growing incidence ranging between 40 and 80 percent Region-wide. As intensive silvicultural methods and timber management planning are increasingly applied to these timber types, these losses will take on a greater significance in the future.

Root and butt rots, principally shoestring root rot and annosus root and butt rot, continued to cause tree mortality throughout the commercial timberlands of Arizona and New Mexico. Results from the 1982 pest damage inventory of Region 3 indicated that root rot tree mortality losses exceed dwarf mistletoe mortality losses each year. Growth losses due to dwarf mistletoe far exceed the growth losses due to root rots. Much of the shoestring root rot mortality is concentrated in ponderosa pine stands; annosus root rot mortality is concentrated in the Douglas-fir, white fir, and spruce-fir timber types.

Status of Major Insect Pests

Spruce beetle, Dendroctonus rufipennis. Spruce beetle-caused tree mortality continued to occur at outbreak levels throughout the spruce-fir type on the Fort Apache Indian Reservation and adjacent portions of the Apache-Sitgreaves National Forests, Arizona. High numbers of spruce faders were observed in the Pecos Wilderness, Carson and Santa Fe National Forests, New Mexico; mortality, however, was substantially lower compared to past years. Smaller groups of spruce beetle-killed trees were also detected along the boundary of the Pecos and Las Vegas Ranger Districts, Santa Fe National Forest, and on the Valle Vidal unit of the Carson National Forest.

Spruce mortality on the Fort Apache Indian Reservation was mainly concentrated within the Fort Apache Mount Baldy Wilderness area and adjacent Mount Baldy Wilderness Area, Apache-Sitgreaves National Forests. Spruce mortality in 1984 occurred on 1,950 acres, compared to 8,500 acres in 1983. However, based on recent ground surveys conducted in 1984, spruce mortality on the reservation is expected to increase on commercial forest lands bordering the wilderness area in 1985.

Mountain pine beetle, Dendroctonus ponderosae. Mountain pine beetle-related tree mortality was at very low levels throughout the ponderosa pine type during 1984. Mountain pine beetle-killed pines were detected on the Kaibab National Forest and Grand Canyon National Park, Arizona, and Carson National Forest, Taos Indian Pueblo, and Santa Clara Indian Pueblo, New Mexico. Mortality was widely scattered and consisted of single and small groups of less than five trees.

Ips engraver beetles, Ips spp. Tree mortality caused by Ips beetles continued to occur at relatively low levels throughout the pine type. Ips-killed pines were most noticeable on the San Carlos and Fort Apache Indian Reservations and the Apache-Sitgreaves and Coconino National Forests. Mortality was widely scattered and consisted mainly of single and small groups of fewer than five trees. Elsewhere throughout the Region, Ips-caused mortality was endemic.

Western spruce budworm, Choristoneura occidentalis. Acres defoliated by these insects increased almost twofold, from 368,400 acres in 1983 to over 692,100 acres in 1984. Defoliation was extensive throughout most of the host type on the Carson, Santa Fe, Cibola, and Lincoln National Forests, adjacent interspersed private lands, the Taos Indian Pueblo, and Mescalero Apache Indian Reservation, New Mexico. Budworm

defoliation was less extensive on the Kaibab National Forest and Grand Canyon National Park, Arizona. Total acres defoliated in Arizona were estimated at 15,625 and in New Mexico, 676,475 acres (figure 1). These data are summarized by ownership class and intensity of defoliation in table 1.

TABLE 1.--Status of western spruce budworm defoliation, Southwestern Region, 1984

Ownership class	Outbreak intensity (acres)			
	Light	Moderate	Heavy	Total
National Forest	143,800	261,225	133,875	538,900
Indian lands	40,175	22,050	12,700	74,925
Other Federal[1]	6,500	700	2,825	10,025
Private lands	8,100	11,725	7,425	68,250[2]

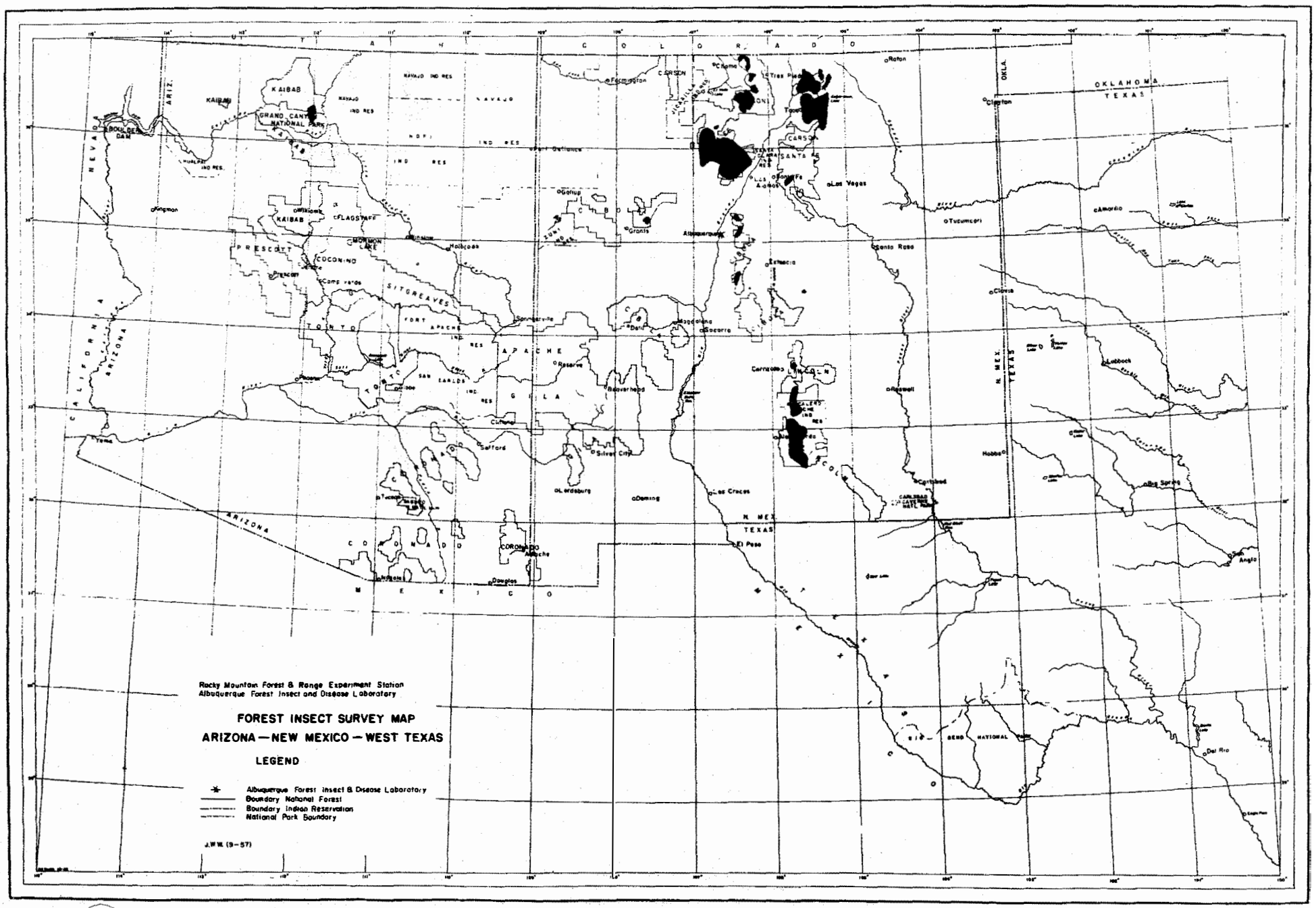
[1]Includes lands administered by National Park Service, Bureau of Land Management, and Department of Defense.
[2]Includes 41,000 acres of State land.

Egg mass surveys conducted on the Carson, Santa Fe, and portions of the Cibola National Forests indicate that budworm defoliation in these areas will continue to occur at high levels in 1985. Budworm larval populations on the Lincoln National Forest and the adjacent Mescalero Apache Indian Reservation were successfully suppressed to very low levels as a result of an insecticide application. Egg mass densities in these treated areas were very low, averaging less than 1 egg mass per 100 buds. Based on these egg mass data, defoliation is expected to be very light and localized in 1985.

Mortality estimates obtained from a recent western spruce budworm loss assessment survey conducted on limited areas of the Carson National Forest for trees 5 inches in diameter or larger ranged from 4 to 19 percent in stands with heavy and extremely heavy defoliation, respectively. Mortality was highest in stands consisting primarily of host species (Douglas-fir, true firs, and spruce) and lowest in stands interspersed with nonhost species (aspen and pines). These losses are expected to increase with continued defoliation.

Aspen defoliators. Aspen defoliation, resulting from the large aspen tortrix, Choristoneura conflictana, and to a lesser degree from the western tent caterpillar, Malacosoma californicum, occurred extensively in New Mexico. The Carson, Santa Fe, and Lincoln National Forests continued to sustain heaviest defoliation. In Arizona, the western tent caterpillar caused localized pockets of aspen defoliation along the North Rim of the Grand Canyon National Park. Total acres defoliated by these insects in 1984 were estimated at 28,675 acres.

FIGURE 1.--Region 3, 1984 western spruce budworm infestation map


Rocky Mountain Forest & Range Experiment Station
Albuquerque Forest Insect and Disease Laboratory
FOREST INSECT SURVEY MAP
ARIZONA — NEW MEXICO — WEST TEXAS
LEGEND
Albuquerque Forest Insect & Disease Laboratory
Boundary National Forest
Boundary Indian Reservation
National Park Boundary
J.W.W. (9-57)

Status of Other Insects

Common name	Scientific name	Host	Locality	Remarks
Sawfly	Neodiprion spp.	Ponderosa pine	Navajo IR, AZ; Kaibab NF, AZ; Capulin National Monument, NM	Isolated infestations
Tiger moth	Halisidota ingens	Pinyon pine, ponderosa pine	Apache-Sitgreaves NF's, AZ; Kaibab NF, AZ; Santa Fe NF, NM; Pecos National Monument, NM	Widespread; damage caused usually very minor.
Woolly pine aphid	Schizolachnus piniradiata	Ponderosa pine	Santa Fe NF, NM	Isolated occurrence
Pinyon needle gall midge	Pinyonia edulicola	Pinyon pine	Kaibab NF, AZ	Isolated occurrence
Pinyon needle scale	Matsucoccus acalyptus	Pinyon pine	Wupatki-Sunset Crater National Monuments, AZ	Caused minor damage to needles
Flatheaded wood borer	Buprestidae	Ponderosa pine	Kaibab NF, AZ	Scattered

Status of Pest Complexes

Widely scattered tree mortality and growth loss, due to a complex of forest insect and disease pests, occurs annually throughout the coniferous forests of the Southwest. Mortality generally occurs in overmature trees predisposed to bark beetle attack and/or disease infection by drought, stand stagnation, fire, root disease centers, dwarf mistletoe, or poor site conditions.

Douglas-fir mortality. Increased numbers of small group Douglas-fir mortality were observed on the Carson and Santa Fe National Forests. Mortality was due to a complex of pests which included the Douglas-fir beetle, Dendroctonus pseudotsugae, root diseases, and Douglas-fir dwarf mistletoe, Arceuthobium douglasii. Most of the mortality observed occurred in areas heavily defoliated by the western spruce budworm.

True fir mortality. Concentrated groups of true fir mortality consisting of 50 or more trees were aerially observed on the Coconino National Forest, Arizona, and Carson National Forest, New Mexico. Elsewhere throughout the Region, true fir mortality consisted of widely scattered single and/or small group tree mortality of 10 or fewer trees. Although no ground examinations were conducted, mortality probably resulted from a complex of root disease and fir engraver beetle, Scolytus ventralis, in white fir, and western balsam bark beetle, Dryocetes confusus, in subalpine or corkbark fir.

Ponderosa pine mortality. Ponderosa pine mortality, which consisted of primarily single trees, was widely scattered throughout the ponderosa pine type in the Southwestern Region. Although not especially prevalent in any one particular area, losses observed were probably due to the western pine beetle, Dendroctonus brevicomis, or the red turpentine beetle, Dendroctonus valens. These bark beetles mainly attack mature or overmature trees weakened by biotic and abiotic factors, such as disease, lightning strikes, fires, or drought.

Status of Major Diseases

Dwarf mistletoes (Arceuthobium vaginatum subsp. cryptopodum--ponderosa pine; A. douglasii--Douglas-fir; A. microcarpum--spruce) caused significant losses in growth and yield on commercial and noncommercial forest lands, infecting conifers on over 2.2 million acres of commercial forest land. Mistletoes caused an estimated growth loss of 100 to 150 million board feet in Arizona and New Mexico in 1984. Ponderosa pine dwarf mistletoe was the most widespread and damaging of these pathogens and was responsible for the greatest losses.

Presuppression surveys were conducted this past year on 53,982 acres of infected ponderosa pine stands on 16 Ranger Districts over 7 National Forests. Survey data provided an accurate accounting of mistletoe incidence and distribution in the heavily infected stands. Silvicultural prescriptions were written for each of the stands based on stand examinations, survey information, and stand diagnoses. RMYLD2, a growth and yield simulation model, was used to refine the prescriptions and aided in the selection of the most appropriate silvicultural alternative for each stand.

The Region-wide mistletoe survey continued in 1984; distribution, intensity, and volume losses associated with dwarf mistletoes were determined for the Coconino and Kaibab National Forests, Arizona. A total of 25,414 acres were surveyed; 23,784 acres in the ponderosa pine timber type and 1,630 acres in other coniferous timber types. Analyses were completed for surveys conducted on the Apache-Sitgreaves, Coconino, and Kaibab National Forests, and final reports will be available in 1985. The survey will continue in 1985 on the Santa Fe National Forest, New Mexico. Results from the three completed surveys indicate that dwarf mistletoe incidence is increasing in the Region and infestations are intensifying in stands. On the Kaibab National Forest, mistletoe incidence in the ponderosa pine timber type has increased from 30 to 34 percent. On the Apache-Sitgreaves and Coconino National Forests, mistletoe incidence in ponderosa pine has increased from 41 to 52 percent and 30 to 32 percent, respectively. Conservative estimates of annual board-foot volume losses in millions of board feet (MMBF) for the Forests are: 20 to 30, Kaibab; 20 to 30, Coconino; 60 to 90, Apache-Sitgreaves. Reports that address mistletoe incidence and associated volume losses in the Douglas-fir, white fir, and spruce-fir timber types will be forthcoming when subroutines dealing with these species are available through RMYLD.

Root diseases were responsible for an approximate 10 percent reduction in growth and yield Region-wide. Estimates range as high as 25 percent in some seriously infected stands. Armillaria mellea accounts for most of the damage and volume loss in conifers, especially ponderosa pine; other root pathogens, including Fomes annosus, Phaeolus schweinitzii, and Inonotus tomentosus, are responsible for the remaining loss. At least 15 to 20 MMBF are lost annually to root rot mortality in the Southwest, and estimates run as high as 45 MMBF, including growth losses. In an effort to ascertain the extent of root diseases in the Southwest, three root rot surveys are scheduled for 1985, and Forest-wide damage and loss assessments have been proposed.

The effectiveness of seedbed fumigation with methyl bromide and chloropicrin was evaluated at the Albuquerque Tree Nursery. Pre- and post-fumigation population surveys indicated that fumigation effectively reduced the levels of Fusarium and Pythium spp. in the fumigated sections and the increases in seedling survival over the

unfumigated sections were significant. Fumigation was effective in reducing Fusarium propagule levels from 4,633 propagules per gram (ppg) to 33 ppg. Seedling densities were increased by 130 percent in the fumigated sections.

Aspen stands in Arizona and New Mexico are attacked by several pathogens which cause stem cankering, most notably: Ceratocystis fimbriata, Hypoxylon mammatum, Cenangium singulare (Encoelia pruinosa), Cytospora chrysosperma, and Cryptosphaeria populina. Canker fungi cause significant reductions in growth and vigor in mature aspen stands, resulting in tree mortality from girdling cankers, top breakage, and cull and degrading. In many of the Region's aspen stands, 30 percent or more of the stems are affected. In addition to the damage and losses associated with stem cankering, the aspen timber type suffers widespread losses to stem decay caused by the false tinder fungus, Phellinus tremulae. White trunk rot incidence is especially significant in mature aspen stands, and cull volumes may range as high as 50 to 60 percent of the total standing volume. As the aspen resource is developed in this Region, and aspen stands are more routinely subjected to timber management planning and commercial entries, it will be necessary to evaluate critically the impact of these diseases and develop management strategies for their control.

Mature and overmature true fir and spruce stands have a scattered incidence of Echinodontium tinctorium. While the pathogen is indigenous to these timber types, losses are considered insignificant. As the relative abundance of overmature and decadent stands decreases, so will the incidence of this pathogen. Similarly, Phellinus pini is endemic in mature and overmature ponderosa pine, true fir, Douglas-fir, and spruce stands. In the future, vigorously growing stands should be lightly impacted by either of these pathogens.

FOREST PEST CONDITIONS IN THE STATE OF ARIZONA

By Robert Celaya[1]

Tiger moths, Halisidota spp. The larvae of these insects were first detected in early April in the Pine-Strawberry area on juniper, ponderosa pine, and white and Douglas-firs. The juniper species apparently does not produce the tent characteristic of this group.

[1]Forest entomologist with the Division of Forestry, Arizona State Land Department.

Ponderosa pine was the most common host for this pest. This insect has been abundant during the last 2 years and this may be an indication of a population upsurge. The last time Halisidota was frequently observed was in 1978. Examination of several areas late in 1984 indicated that these insects will again be numerous in 1985.

Comandra blister rust, Cronartium comandrae. This rust was identified on Eldarica pine, Pinus eldarica, in Sedona. Last year it was first detected in the Prescott area. The rust has not infected trees less than 6 years old. Branch and trunk infections have been noted in both areas. There is no effective control of this disease, and future planting of this ornamental pine is not recommended in these two areas. Surveys for this rust in other areas of the State will continue in 1985.

Fall webworms, Hyphantria sp. Severe defoliation to Arizona walnut trees was recorded in the Washington Park area below the Mogollon Rim. If the defoliation continues in 1985, biological control with Bacillus thuringiensis will be recommended.

Dwarf mistletoes, Arceuthobium spp. This parasite is widespread on State and private lands and is a serious tree problem. Several possible projects to reduce its presence on private land are tentatively scheduled for 1985. Dwarf mistletoe is widespread in the Alpine, Greer, and Lakeside-Pinetop areas; public presentations will address the problem.

Inconsistent results of dwarf mistletoe treatment on State lands southwest of Flagstaff in the past have been addressed. Trained State Forestry personnel have re-marked infected trees to make certain the problem will not intensify. Regular followups are planned during the different stand entries in order to insure that the parasite is reduced to endemic levels.

Urbanization stresses in forested areas is probably the second most common cause of tree damage and mortality. Individual efforts to reduce this problem have been marginally successful. Several communities and homeowner associations have expressed an interest in writing and implementing specific tree protection measures. Presentations to inform and educate builders and contractors about the problem will continue in the upcoming year.

FOREST PEST CONDITIONS IN THE STATE OF NEW MEXICIO

By Anthony H. Smith and John O. Johnsen[2]

Western spruce budworm, Choristoneura occidentalis. Western spruce budworm increased in both intensity and area infested on State and

[2]Forest entomologists with the New Mexico Department of Agriculture.

private lands in 1984. A total of 41,009 acres of defoliation was noted from aerial survey. Increases were noted on the Baca Location No. 1, the Philmont Scout Ranch, the general vicinity of the Moreno Valley, and most notably Rio Arriba County where defoliation increased from 175 acres in 1983 to 7,420 acres in 1984. Egg mass surveys indicated that defoliation intensities will be moderate to severe in 1985, with the greatest potential for increase and severe defoliation in the extensive host type in Rio Arriba County around Chama.

Western tent caterpillar, Malacosoma californicum, and large aspen tortrix, Choristoneura conflictana. These insects continued to cause aspen defoliation throughout the host type in northern New Mexico. The total area defoliated increased from the previous year to somewhat over 30,000 acres, but defoliation intensity appeared less, with 16,650 acres exhibiting heavy to severe defoliation. The general area infested by the tent caterpillar is that host type west of State Highway 84, while the tortrix predominates to the east. Nucleopolyhedrosis virus was noted in a small percentage of late instar tent caterpillar larvae near Chama, but this is not expected to have any significant impact on the population at this stage of the outbreak cycle and defoliation will likely remain high.

Douglas-fir tussock moth, Orgyia pseudotsugata. The chronic infestation of ornamental spruce, true firs, and Douglas-fir continued in Santa Fe; only those trees that have been sprayed annually for several years have survived this infestation now in its nineteenth consecutive year. The resistance of many property owners and groups to chemical treatment precludes a concerted city-wide suppression project. The tussock moth was also reported infesting five ornamental spruce in Ruidoso. No new infestations were detected during aerial survey of forested areas.

Gypsy moth, Lymantria dispar. For the past 8 years, the Department of Agriculture has cooperated with APHIS in placing pheromone traps in areas likely to become infested with this insect. Gypsy moth larvae are defoliators and consume the leaves of over 500 species of plants in North Amercia. This insect has established itself in many area of the United States, but was not known to be in New Mexico until this year. This year's trapping survey caught a single male moth in Roswell. All stages in the life cycle may be transported by motor vehicles, but most commonly the pupae and the egg masses are the cause of spread. None were trapped anywhere else in the State. The survey will be expanded in 1985 to 1,000 traps placed in appropriate sites.

Oak defoliation, family Tortricidae, genus unknown. An estimated 10,000 acres of Gambel oak were defoliated by an unidentified tortricid in the vicinity of the Sargent Wildlife Refuge near Chama and in the Tierra Amarilla Grant. This outbreak has declined significantly from the 44,000 acres defoliated in 1983. A moderate level of defoliation is expected to continue in 1984.

Pinyon sawfly, Neodiprion edulicolis. Several small, localized outbreaks of pinyon sawfly were noted around the State in 1984. The two most severe were near Silver City, involving approximately 15 acres, and near Albuquerque, involving scattered trees over approximately 40 acres. Damages were slight and no significant impact is expected.

Pinyon needleminer, Coleotechnites edulicola. Approximately 2,000 acres of pinyon pin were moderately infested near Coolidge and an additional 1,500 acres were lighly infested northwest of Santa Fe. The outbreak in the Coolidge area is in its fourth year and is relatively static. The outbreak near Santa Fe is centered around the Las Tierras development and was first noted in 1982. This outbreak is expected to expand somewhat in 1985.

Pinyon needle scale, Matsucoccus acalyptus. New infestations of this scale insect were detected near La Luz. This infestation covered about 30 acres, and high value trees near home sites were treated with dimethoate in the early spring. The infestation near Capitan has been heavy for several years and many of the trees now exhibit very poor condition, retaining only new growth with needles greatly reduced in length. The moderate infestation in the southern areas of Santa Fe was somewhat less severe than in 1983.

European elm scale, Gossyparia spuria. Most of the American elms in Socorro, Santa Fe, Las Vegas, and Raton are heavily infested with this scale and some Lecanium sp. scales. Sooty mold fungus, growing on the honeydew secreted by the scales, has turned the upper branches, limbs, and trunks black. These sucking insects have caused considerable damage to the trees in the form of branch and limb mortality, creating ideal breeding habitat for Scolytus multistriatus, the smaller European bark beetle. This beetle is responsible for the spread of Dutch elm disease, but, to date, the disease has not been detected in New Mexico.

Scarab beetle, Phyllophaga sp. These beetles are active as adults feeding at night on both broad-leaved trees and shrubs and occasionally on conifers. Approximately 5 acres of young pinyons were almost completely defoliated in 1981, and to a lesser extent in 1984 west of Moriarty. This same species greatly reduced the grazing capacity of nearly 5,000 acres of rangeland near Datil in 1981, but did not appear in 1984. Grubs of this species spend 2 to 4 years in the soil feeding on the roots of grasses and other plants. Those beetles attacking pinyons were controlled both years by foliar insecticide applications, and fair foliage protection was obtained in 1984.

Engraver beetles, Ips. spp. As New Mexico grows, the pressure for recreational cabins and "homes in the woods" increases. More private landowners are requesting advice on engraver beetle problems than for any other group of insects. This is especially true in pinyon-juniper woodlands adjacent to the National Forests. The greatest problem is one of education. Most beetle attacks occur in trees damaged during

home construction. Typically, pinyon trees are attacked during or soon after construction is completed. Many of these people are also bringing firewood home to burn that is infested, and their weaker trees are being attacked by beetles emerging from the wood. Dozens of isolated tree kills were noted in 1984, but no large-scale outbreaks occurred.

Douglas-fir beetle, Dendroctonus pseudotsugae. The only major losses caused by bark beetles were attributed to this insect in conjunction with annosus root rots. As with other beetle species, the number of trees killed was down considerably. In remote areas of the Vermejo Park and the Chama Land and Cattle Company, groups of 5 to 50 Douglas-fir were killed in drainage bottoms and on other poor sites. There is little attempt to salvage any of these trees.

Twig beetle, Pityophthorus spp. Extensive branch flagging caused by twig beetles was first noted in 1983 on the Mirabal Ranch southwest of Grants. Ponderosa pine over approximately 800 acres exhibited light to moderate branch flagging in 1984 as a result of beetle activity. Pole-sized trees were the most heavily affected. The outbreak apparently started in a thinned area; no significant damages have occurred, though a continuation of the outbreak is expected in 1985.

Spruce beetle, Dendroctonus rufipennis. Four small pockets of activity totaling approximately 30 acres were noted adjacent to the northeast boundry of Chama Land and Cattle Company property east of Chama. This is an expansion from the initial sighting in 1983 and is the first significant infestation since the subsidence of the last major outbreak in the early 1960's. Because of the vulnerable condition of the host type, it is expected that this infestation will spread somewhat in severity and extent in 1985.

Boxelder bug, Leptocoris triviltatus. Boxelder bugs were particularly numerous in the Tesuque area north of Santa Fe in 1984.

Dimerium juniperi. Approximately 5 acres of junipers in the vicinity of Capitan exhibited this smudge disease on shoots and needles. Some decline of tips was noted, but no serious damage is expected.

Red belt. Unseasonably warm temperatures following a very cold period in late December 1983 resulted in more than 150,000 acres of coniferous forest showing the effects of this physiological winter drying condition. The condition, while State-wide in extent, was most pronounced on the eastern slope of the Sangre de Cristo Range, in particular from Las Vegas to the New Mexico-Colorado border. Ground surveys were conducted in early July in the red belt areas above Ute Park to determine mortality, damage, and possible secondary effects. Pines and Douglas-fir were greening by that time with new growth. True firs, however, were severely affected with total bud kill being the rule. No secondary insect outbreaks were noted. Follow-on surveys will be conducted in 1985 to monitor those areas.

FOREST PEST MANAGEMENT ACTIVITIES IN 1984

Major activities of the Southwestern Region Forest Pest Management (FPM) staff include detection, evaluation, and suppression of forest pests and technical assistance to forest land managers on all Federal lands in Arizona and New Mexico. In addition, FPM personnel cooperated with the States of Arizona and New Mexico in carrying out forest pest management activities on State and private lands though the Cooperative Forest Pest Action Program.

Detection Surveys

Detecting and monitoring insect and disease outbreaks and infestations is a major responsibility of the FPM staff. This is accomplished by systematic aerial surveys, ground examinations, and encouraging forest workers to report unusual and suspected insect and disease occurrences by means of field surveillance kits provided by FPM.

Aerial surveys were conducted from July through August over 7.5 million acres of coniferous forests in Arizona and New Mexico to determine the location and extent of damage caused by insects and/or diseases. Upon completion of the surveys, maps showing the location, relative intensity, and kinds of outbreaks were prepared and sent to the respective administrative units.

Ground examinations were made, when necessary, to confirm aerial detection observations, as well as in response to requests from land managers for detailed information or identification. State pest management specialists conducted ground surveys on State and private lands in Arizona and New Mexico.

A wide variety of insects and diseases were identified by the staff from surveillance reports sent by forest workers from across the Region. Such reports are important for the early detection of potential pest problems, and land managers and forest workers are encouraged to continue to be alert for, and prompt in, reporting any unusual insect and disease activity.

Evaluations

Another major responsiblity of FPM is to evaluate forest pest problems and provide land managers with alternatives and recommendations for management through a variety of approaches. Twenty-one evaluations were conducted in 1984.

Entomology: The following new and continuing insect evaluations were conducted in 1984: (1) Spruce beetle, Population trends and tree losses on the Fort Apache Indian Reservation, Arizona; (2) results of the 1984 Western Spruce Budworm Suppression Project, Lincoln National Forest and the Mescalero Apache Indian Reservation, New Mexico; (3) results of the 1984 Western Spruce Budworm Suppression Project, Carson National Forest, New Mexico; (4) an evaluation of insect conditions on

the Sandia Peak Ski area, Cibola National Forest, New Mexico; (5) an evaluation of western spruce budworm conditions on the Lincoln National Forest and Mescalero Apache Indian Reservation, New Mexico; (6) an evaluation of western spruce budworm conditions on the Carson National Forest, New Mexico; (7) an evaluation of western spruce budworm conditions on the Santa Fe National Forest and Jemez and Santa Clara Indian Pueblos, New Mexico; (8) an evaluation of western spruce budworm damages along the upper and lower Red River drainages, Carson National Forest, New Mexico; (9) an evaluation on the status of the pondora moth, Kaibab National Forest, Arizona; (10) a continuing assessment of western spruce budworm conditions and defoliation on loss assessment plots in mixed conifer stands, Carson National Forest, New Mexico; (11) a continuing assessment of western spruce budworm conditions and defoliation occurring in the silvicultural demonstration area, Carson National Forest, New Mexico.

Pathology: Biological evaluations, included: (1) Evaluation of the effectiveness of soil fumigation, with methyl-bromide and chloropicrin, in reducing populations of Pythium and Fusarium spp. in seedbeds at the Albuquerque Tree Nursery, Cibola National Forest, New Mexico; (2) interim evaluation of the 1,310 acre Blanco dwarf mistletoe suppression project on the Espanola District, Santa Fe National Forest, New Mexico; (3) evaluation of the Turkey Creek dwarf mistletoe suppression project, including 17 dwarf mistletoe-infected stands on the Fort Apache Indian Reservation, Arizona; (4) evaluation of compartment examinations from 18 dwarf mistletoe-infected stands on the Mescalero Apache Indian Reservation, New Mexico; (5) evaluation of compartment examinations from 7 dwarf mistletoe-infected stands on the Jemez and Isleta Indian Reservations, New Mexico; (6) postsuppression evaluation of the Payson summer home dwarf mistletoe control project No. 3-82-14, Payson District, Tonto National Forest, Arizona; (7) evaluation of pest conditions on Taos Pueblo lands, New Mexico; (8) dwarf mistletoe evaluation of the Ponderosa Campground, Payson District, Tonto National Forest, Arizona; (9) evaluation of disease conditions at the Sandia Peak Ski area, Cibola National Forest, New Mexico; and (10) evaluation of red belt--an abiotic conifer disease--on the Carson, Cibola, Lincoln, and Santa Fe National Forests. Dwarf mistletoe presuppression surveys and suppression projects conducted during 1984 included:

National Forest	Ranger District	Acres	Survey	Suppression
Carson	El Rito	1,647	X	
	Penasco	533	X	
	Taos	1,500	X	
Santa Fe	Las Vegas	8,000	X	
	Jemez	6,800	X	
	Espanola	8,325	X	
Lincoln	Cloudcroft	4,800	X	
Kaibab	Williams	90		X

National Forest	Range District	Acres	Survey	Suppression
Apache-Sitgreaves	Springerville	2,200	X	
	Alpine	276	X	
	Heber	2,822	X	
	Chevelon	803	X	
Coconino	Flagstaff	5,000	X	
	Mormon Lake	2,225	X	
	Blue Ridge	7,000	X	
	Long Valley	1,051	X	
Tonto	Pleasant Valley	120		X
	Payson	415		X
Prescott	Chino Valley	1,000	X	

Suppression Projects

Forest insect and disease pests occasionally increase to significant levels and cause unacceptable damages to forest resources. These pests must then be managed by employing a combination of silvicultural, mechanical, biological, and/or chemical suppression strategies.

In 1984, Forest Pest Management conducted or participated in the following suppression projects: (1) Aerial application of the insecticides carbaryl and B.t. to building western spruce budworm populations on the Lincoln National Forest and Mescalero Apache Indian Reservation (240,900 acres); (2) aerial applications of B.t. to epidemic western spruce budworm populations on the western half of the Carson National Forest (34,600 acres); and (3) thinning, pruning, chipping, and/or removing infested trees to control dwarf mistletoe infestations on the Kaibab (90 acres) and Tonto (535 acres) National Forests, Arizona.

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